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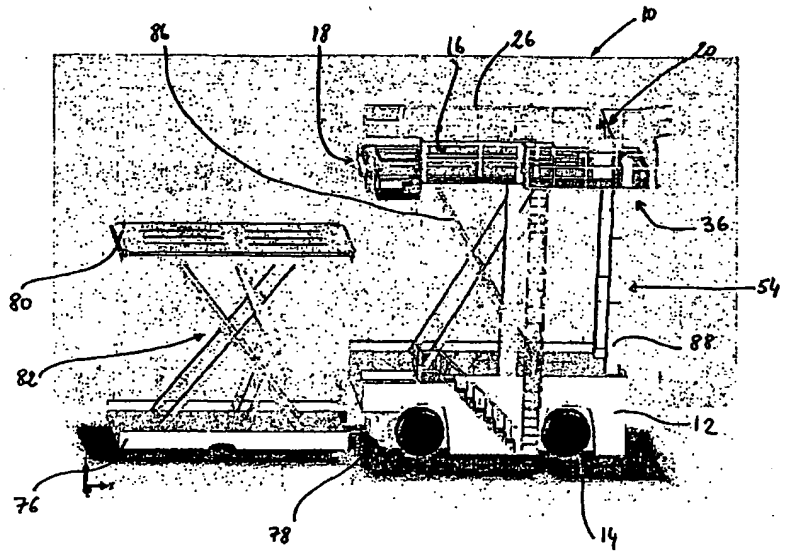

(57) Abstract: The invention provides an aircraft loader for loading and unloading goods in and out of an aircraft. The aircraft loader is provided with an interface device for interfacing the loading platform with the loading level of the aircraft. The interface device has a bridge platform and retractable handrails mounted along one of the ends of the bridge platform for advantageously providing working area for the operator of the loader and the operators inside the aircraft. This protected area advantageously has a secure configuration which provides a good vision of the loader parts and aircraft bay to the loader operator while providing a safe emergency path always accessible to the operators. Advantageously, the aircraft loader allows to reach lower, main and upper decks of an aircraft while being safely operated.

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AIRCRAFT LOADER

FIELD OF THE INVENTION

The present invention generally relates to an aircraft loader for transferring cargo and freight to and from an aircraft cargo bay. The invention more particularly concerns an aircraft loader particularly adapted to aircrafts having lower, main and upper decks while providing an enhanced safe use thereof.

BACKGROUND OF THE INVENTION

Loaders are used for aircraft servicing, and are designed to transfer containers, pallets, luggages and other types of goods to the aircraft. Many of the existing loaders have an elevator platform, a bridge platform for interfacing the elevator platform to the aircraft cargo bay, and a control station for controlling operation of the loader.

French patent No. 2.031.709 and US patents Nos. 3,993,207 and 4,304,518 provide examples of loaders known in the art.

Most of the aircraft currently in use, such as Boeing, Airbus, etc., have lower and main decks and therefore only LDLs (lower deck loader) and MDLs (main deck loader) are used. However, both of these loaders are not designed for new types of aircrafts, such as the A380® from Airbus® for example, since such aircrafts are provided with lower, main and upper decks. Indeed, LDLs and MDLs cannot reach the upper deck of such aircrafts and UDLs (upper deck loader) are thus required.

Known in the art, there is US patent application No. 2004/0115034 which describes an apparatus and a method for loading and unloading an aircraft

provided with an upper deck. The disclosed apparatus has a first loader provided with a loading platform movable between an uppermost position disposed substantially coplanar with the load level of the aircraft, and a lowermost position disposed substantially coplanar with the load level of a raised loading platform of a second loader. The first loader thus forms an adapter between the aircraft and the second loader. The first loader is also provided with a transfer bridge adjacent to the loading platform and capable of being docked adjacent the aircraft.

The service operations which can be done with such an apparatus are limited by its bulky design. Indeed, two distinct loaders are required and have to be operated separately. Thus, the first loader has to be dock to the aircraft, and, then, the second loader has to be precisely positioned with respect to the first loader. This complicates the operations which have to be made and the control of the apparatus itself is also complicated.

Moreover, in the proposed design, the control station is located on the loading platform of the first loader. Thus, the operator has a poor vision of various parts of the loaders and of the load level of the aircraft, especially when the loading platform is lowered. Two operators will thus generally be required to operate the apparatus in a more safety manner, the first one being on the loading platform while the second one is on ground. However, none of the operators has a good vision of the load level of the aircraft. This could be problematic since goods can fall down of the aircraft when the loading platform is lowered and hurt the operator placed thereon.

Also of interest, there is PCT application of the same Applicant, published under publication number WO2004/096642, which describes an aircraft loader having a configuration allowing to meet full loading cycle requirements imposed by airlines while leaving a good vision of the loader parts to the operator during cargo

operation since the control station is mounted on the bridge platform. However, even if safety of the loader operator is improved, safety issues of others operators working inside the aircraft still remains since they are not protected from falling down of the aircraft bay. Moreover, its cumbersome design decreases the operator visibility when driving.

Furthermore, even if this aircraft loader has proved to be very efficient, manoeuvrability and transportability of such bulky aircraft loaders remain important issues. Such aircraft loaders are also expensive to manufacture.

Also of interest, there are US Patent No. 4,799,848; European patent applications Nos. 0 698 525 and 1 277 681; and PCT application No. PCT/GB90/00937.

Even if the art provides aircraft loaders adapted to reach the upper deck of an aircraft, none of the above-described documents provide an aircraft loader which meets full loading cycle requirements imposed by airlines while providing an enhanced safe use thereof.

It would therefore be desirable to provide an aircraft loader adapted to transfer goods to and from lower, main and upper decks of an aircraft in an enhanced safe manner, while meeting full loading cycle requirements imposed by airlines.

SUMMARY

An object of the present invention is to provide an aircraft loader that satisfies the above-mentioned needs.

Accordingly, the present invention provides an aircraft loader for loading and unloading goods in and out of an aircraft having a loading level. The aircraft loader

is provided with a main chassis and a loading platform mounted on the chassis. The loading platform is moveable between a lower elevation level and an upper elevation level substantially coplanar with the loading level of the aircraft. The loading platform has a loading end opposite an unloading end and two side edges. The aircraft loader is also provided with an interface device mounted on the chassis for interfacing the unloading end of the loading platform with the loading level of the aircraft. The interface device has a bridge platform moveable between a base elevation level and the upper elevation level. The bridge platform has a loading end opposite an unloading end and two side edges. The bridge platform further has a transfer portion extending between the ends thereof. The loading end of the bridge platform extends in adjacent alignment along the unloading end of the loading platform when both platforms extend at the upper level for providing a goods path between the loading platform and the loading level of the aircraft through the transfer portion. The interface device also has retractable handrails mounted along a respective one of the ends of the bridge platform. The retractable handrails have an extended position wherein the handrails are raised above the upper elevation level across the goods path for blocking passage of the goods between the loading level of the aircraft and the loading platform. The retractable handrails also have a retracted position wherein the handrails are moved away from the goods path when both platforms extend at the upper elevation level for allowing passage of the goods between the loading level of the aircraft and the loading platform. The aircraft device is also provided with a lifting device for raising and lowering each of the loading platform and the bridge platform between their respective elevation levels and control means for controlling operation of the lifting device.

Advantageously, the aircraft loader of the present invention allows to reach lower, main and upper decks of an aircraft while allowing to meet full loading cycle requirements imposed by airlines.

Moreover, the aircraft loader of the present invention can advantageously be safely operated by a single operator while providing a configuration which leaves a good vision of the loader parts and aircraft bay to the operator.

Furthermore, thanks to the retractable handrails of the interface device, the safety of the loader operator is enhanced since goods can not fall down from the aircraft. The retractable handrails also prevent the operators working inside the aircraft to fall down of the aircraft.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects and advantages of the invention will become apparent upon reading the detailed description and upon referring to the drawings in which:

Figure 1 is a perspective side view of an aircraft loader according to the present invention, the aircraft loader being provided with an additional platform.

Figure 2 is a perspective front view of the aircraft loader of Figure 1.

Figure 3 is a perspective top view of the aircraft loader of Figure 1.

Figure 4A is a side view of the aircraft loader shown in Figure 1.

Figure 4B is a top view of the aircraft loader shown in Figure 1.

Figure 4C is a front view of the aircraft loader shown in Figure 1.

Figure 5A is a side view of the aircraft loader of Figure 1.

Figure 5B is a top view of the aircraft loader of Figure 1.

Figure 5C is a front view of the aircraft loader of Figure 1.

Figure 6 is another perspective side view of an aircraft loader according to the present invention, the aircraft loader being provided with another additional platform.

Figure 7 is another perspective front view of the aircraft loader of Figure 1, the loading platform being shown in three different positions.

Figure 8 is another perspective front view of the aircraft loader of Figure 1, the loading platform being shown in the upper position.

Figure 9 is a perspective rear view of the aircraft loader of Figure 1, the bridge platform being docked to the main deck of the aircraft.

Figure 10 is another perspective rear view of the aircraft loader of Figure 1, the bridge platform being docked to the upper deck of the aircraft.

Figure 11 is another perspective rear view of the aircraft loader of Figure 1.

Figure 12 is another perspective rear view of the aircraft loader of Figure 1.

Figure 13A is a perspective rear view of the loading platform and the bridge platform of the aircraft loader of Figure 1, the bridge platform being docked to a deck of the aircraft.

Figure 13B is another perspective rear view of the loading platform and the bridge platform shown in Figure 1, the bridge platform being docked to a deck of the aircraft.

Figure 14 is a partial perspective front view of the bridge platform of the aircraft loader shown in Figure 1, the bridge platform being docked to a deck of the aircraft.

Figure 15 is another perspective rear view of the loading platform and the bridge platform, the handrails extending in a retracted position.

Figures 16A and 16B show the aircraft device of Figure 1 and the additional platform in a dismantled position.

Figures 16C and 16D show the aircraft device of Figure 1 in a dismantled position.

Figures 17A and 17B show the aircraft device of Figure 1 and the additional platform in a dismantled position for transportation in an aircraft.

Figures 17C and 17D show the aircraft device of Figure 1 in a dismantled position for transportation in an aircraft.

Figure 18 is a perspective view of a bridge platform of an aircraft loader according to the present invention.

Figure 19A shows retractable handrails according to a preferred embodiment of the present invention, the handrails extending in the extended position.

Figure 19B shows the retractable handrails of Figure 19A, the handrails extending

in an intermediate position.

Figure 19C shows the retractable handrails of Figure 19A, the handrails extending in the retracted position.

Figure 20 is a bottom view of an articulated aircraft loader according to a preferred embodiment of the present invention.

Figure 21 is a partial view of the articulated aircraft loader shown in Figure 20.

While the invention will be described in conjunction with example embodiments, it will be understood that it is not intended to limit the scope of the invention to such embodiments. On the contrary, it is intended to cover all alternatives, modifications and equivalents as may be included as defined by the appended claims.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the following description, similar features in the drawings have been given similar reference numerals and in order to lighten the figures, some elements are not referred to in some figures if they were already identified in a precedent figure.

Referring to Figures 1 to 5C and 9, there is shown an aircraft loader **10** for loading and unloading goods (not shown) in and out of an aircraft **28** having a loading level **30**. The loading level **30** can advantageously be the lower, the main or the upper deck of the aircraft **28**. Thus, it is important to note that the present loader **10** can advantageously be used with any types of aircraft, including newer big aircrafts such as the A380® from Airbus® for a non-limitative example. The aircraft loader **10** is provided with a main chassis **12**, advantageously having

wheels **14** for displacement of the loader **10** on the tarmac **32**. Preferably, the aircraft loader **10** has lowerable stabilizing legs (not shown) projecting under the main chassis **12** for stabilizing the loader **10** when in use. The aircraft loader **10** is also provided with a loading platform **16** mounted on the chassis **12** and moveable between a lower elevation level and an upper elevation level substantially coplanar with the loading level **30** of the aircraft **28**. Preferably, the upper elevation level extends at the level of the upper deck of the aircraft **28** for allowing loading thereof. However, it could also be envisaged to use the present aircraft loader **10** to load aircrafts having only lower and main deck. The loading platform **16** has a loading end **18** opposite an unloading end **20** and two side edges **22**, **24**. Preferably, the loading platform **16** is provided with side handrails **26** extending on each side thereof. Goods generally include containers of a predetermined size. Thus, preferably, as illustrated on Figure 15, the loading platform **16** has a length adapted to provide support for two containers **34** which are transferred in line on the loading platform **16**, one after the other, thereby allowing to meet full loading cycle requirements imposed by airlines.

Still referring to Figures 1 to 5C and 9, the aircraft loader **10** is also provided with an interface device **36** mounted on the chassis **12** for interfacing the unloading end **20** of the loading platform **16** with the loading level **28** of the aircraft **30**. The interface device **36** has a bridge platform **38** moveable between a base elevation level and the upper elevation level. The bridge platform **38** has a loading end **40** opposite an unloading end **42** and two side edges **44**, **46**. The bridge platform **38** further has a transfer portion **48** extending between the ends **40**, **42** thereof. The loading end **40** of the bridge platform **38** extends in adjacent alignment along the unloading end **20** of the loading platform **16** when both platforms **16**, **38** extend at the upper level for providing a goods path **50** between the loading platform **16** and the loading level **30** of the aircraft **28** through the transfer portion **48**, as better illustrated on Figure 15. Thus, referring now also to Figure 15, when both

platforms **16**, **38** extends at the aircraft loading level **30**, goods are allowed to move from the loading platform **16** to the aircraft loading level **30** through the transfer portion **48**. The interface device **36** also has retractable handrails **52** mounted along a respective one of the ends **40**, **42** of the bridge platform **38**. As better shown on Figure 12, the retractable handrails **52** have an extended position wherein the handrails **52** are raised above the upper elevation level across the goods path **50** for blocking passage of the goods between the loading level **30** of the aircraft **28** and the loading platform **16**. The retractable handrails **52** also have a retracted position wherein the handrails **52** are moved away from the goods path **50** when both platforms **16**, **38** extend at the upper elevation level for allowing passage of the goods between the loading level **30** of the aircraft **28** and the loading platform **16**, as better shown on Figure 15.

Still referring to Figures 1 to 5C, the aircraft loader **10** is also provided with a lifting device **54** for raising and lowering each of the loading platform **16** and the bridge platform **38** between their respective elevation levels, as it will be more detailed thereinafter. The aircraft loader **10** also has control means for controlling operation of the lifting device.

Referring now to Figures 19A to 19C, in a preferred embodiment, the interface device **36** further advantageously comprises a handrails retracting mechanism (not shown) operatively connected to the retractable handrails **52** for operating the handrails **52** between each of the extended and retracted positions. Figure 19A shows the handrails **52** in the extended position, Figure 19C shows the handrails **52** in the retracted position while Figure 19B shows an intermediate position of the handrails **52**. Preferably, the handrails retracting mechanism is responsive to a movement of the loading platform **16**. Indeed, when the loading platform **16** moves close to the bridge platform **38**, the handrails retracting mechanism is activated to operate the handrails **52** accordingly. In the illustrated case, the

handrails **52** vertically fold on itself. However, it should be noted that any convenient means for moving the handrails **52** away of the goods path **50** could be envisaged. For example, the handrails retracting mechanism may comprise a weight-and-pulley device for vertically lowering the handrails **52** below the upper elevation level when each of the platforms **16, 38** extends at the upper elevation level. Alternatively, the handrails retracting mechanism may be provided with a pivot device for pivoting the handrails below the upper elevation level when each of the platforms **16, 38** extends at the upper elevation level.

Referring again to Figures 9 and 10 and also to Figure 14, preferably, the retractable handrails **52** are mounted along the loading end **40** of the bridge platform **38**, as it can be better seen on Figure 3. More preferably, the bridge platform **38** has side handrails **56** extending on each side thereof. Thus, the retractable handrails **52** and the side handrails **56** define a protected working cell **58** around the bridge platform **38** that prevents operators working inside the aircraft **28** falling down of the aircraft **28** when the loading platform **16** is lowered. This protected working cell **58** also allows to prevent goods from falling down of the aircraft **28** when the loading platform **16** is lowered, thereby also enhancing safety of the loader operator which is then protected against unwanted movements of goods. With this particular embodiment, there is advantageously no man's land area on both platforms **16, 38**. Even more preferably, referring now also to Figures 13A and 13B, in order to provide an aircraft loader **10** particularly adapted to any particular aircraft which can have bays of different wide, the bridge platform **38** is further provided with a retractable door extension **60** extending on a respective one of the side edges **44, 46** of the bridge platform **38**. With this particular embodiment, the protected working cell **58** can be entirely closed for improving safety of the operators. Preferably, the retractable door extension **60** is pivotally mounted to the respective side edge **44, 46** of the bridge platform **38** even if other arrangement could also be envisaged. In order to provide a more

convenient door extension **60**, one could also provide a telescopic retractable door extension. Of course, the bridge platform **38** could also be provided with first and second retractable door extensions, each extending on a respective one of the side edges **44**, **46** of the bridge platform **38**.

Referring again to figures 3 and 4 and also to Figures 13A and 18, the bridge platform **38** further advantageously has an operating portion **62** extending in adjacent relationship sideways to the transfer portion **48**. Moreover, the control means is advantageously provided with a control station **64** mounted on the operating portion **62** of the bridge platform **38** for operating each of the platforms **16**, **38**. This preferred configuration leaves a good vision of the loader parts and aircraft bay to the operator. Moreover, the operating portion **62** of the bridge platform **38** is preferably provided with operating portion handrails **66** surrounding the operating portion **62** for providing a protected working cell **68** to the loader operator working on the operating portion **62**.

Referring now to Figure 8, the bridge platform **38** is advantageously further provided with a ladder **70** attached to the operating portion **62** for providing a safe emergency path **72** accessible from the operating portion **62**. Preferably the ladder **70** is a telescopic ladder. With this particular embodiment, the loader operator and the operators working inside the aircraft **28** can access to this ladder **70** in all time to quickly evacuate the aircraft **28** if needed, whatever the position of the loading platform **16**.

Referring now to Figure 7, the loading platform **16** may advantageously be provided with a nacelle **74** attached thereto. When both the loading platform **16** and the bridge platform **38** extend at the same level, the nacelle **74** will advantageously extend in adjacent relationship with the operating portion **62** of the bridge platform **38** for providing to the aircraft operators a safe access to the

aircraft **28** from the loader **10**. Of course, the nacelle **74** and/or the handrails **66** extending around the operating portion **62** can be provided with a door for providing an easy access to the operators.

Referring again to Figures 1 to 3 and 5A to 5C, the aircraft loader of the present invention may advantageously be used with another platform connectable to the loading platform **16**. Generally, the level of the aircraft upper deck extends at approximately 8 to 10 meters. Thus, the present aircraft loader **10** is advantageously used with an existing loading platform or another conventional aircraft loader, as can be seen on Figure 6, to transfer the load from a first level to a second level, and then, from the second level to the upper deck. Such an arrangement is particularly advantageous since it allows to use existing materials currently in use to provide an effective solution.

Thus, according to a further preferred embodiment of the present invention, as illustrated in Figures 1 to 3 and 5A to 5C, the aircraft loader **10** has an additional chassis **76** connectable to the main chassis **12**. The aircraft loader **10** also has a connecting device **78** mounted on the main chassis **12** proximate the loading end **18** of the loading platform **16** for pivotally connecting the additional chassis **76** to the main chassis **12**. The aircraft loader **10** is also provided with an additional platform **80** mounted on the additional chassis **76**. The additional platform **80** is moveable between a first elevation level and a second elevation level. The second level is comprised between the lower and upper elevation levels for allowing transfer of the goods between the additional platform **80** and the loading platform **16** when both the loading platform **16** and the additional platform **80** extend at a same level. The aircraft also has an additional lifting device **82**, preferably a scissor-type mechanism, for raising and lowering the additional platform **80** between the first elevation level and the second elevation level. Preferably, the second elevation level extends at the lower elevation level. More preferably, the

control means control operation of the additional lifting device **82**.

In a further preferred embodiment, the aircraft loader **10** is further advantageously provided with a platforms coupling means (not shown) for removably coupling the loading platform **16** and the bridge platform **38** together when both platforms **16**, **38** extend at a same level. Preferably, the coupling means has a first coupling device mounted on the loading platform **16** and a second coupling device mounted on the bridge platform **38**. Each of the first and second coupling means advantageously cooperates with each other when both platforms **16**, **38** extend at the same level. Thus, the first coupling device may be, for example, a rod lockable with the second coupling means. Preferably, the second coupling means is a passive device since the bridge platform **38** is unpowered. However, others arrangements could be envisaged.

Referring now to Figures 5A to 5C and also to Figure 9, in the case the aircraft loader **10** is provided with an additional loading platform **80**, an additional coupling means **84** may advantageously be used for coupling the loading platform **16** to the additional platform **80**. Preferably, the additional coupling means **84** will be of the same type of the platforms coupling means.

Referring again to Figures 1 to 4C, the lifting device **54** may advantageously be provided with a scissor-type mechanism **86** operatively connected between the chassis **12** and the loading platform **16**. Moreover, the lifting device **54** is preferably further provided with a telescopic support mechanism **88** operatively connected between the chassis **12** and the interface device **36** for supporting the interface device **36** when the interface device **36** is raised. Thus, when both platforms **16**, **38** extend in the lower position, the platforms **16**, **38** are advantageously securely coupled together. The scissor-type mechanism **86** is operated for raising the loading platform **16**. Since the bridge platform **38** is

securely coupled to the loading platform **16**, the bridge platform **38** is raised with the loading platform **16** until the desired height is reached. At this time, the telescopic support mechanism **88** supports the bridge platform **38** in its raised position. The bridge platform **38** can then be uncoupled from the loading platform **16**. The loading platform **16** can then move independently for loading or unloading the aircraft since the interface device **36** stay in the raised position during the transfer of goods. When the transfer of goods is finished, the loading platform **16** is coupled again to the interface device **36** and the bridge platform **38** is lowered with the loading platform **16** with the help of the scissor-type mechanism **86**. This embodiment is particularly advantageous since the interface device **36** has not to be powered. Of course others arrangement could be used.

In a further preferred embodiment, the interface device **36** is further provided with an interface device tilt mechanism (not shown) for tilting the bridge platform **38** in substantial alignment with the loading level **30** of the aircraft **28**. This allows to align the attitude of the bridge platform **38** with the attitude of the loading level **30** of the aircraft **28** which is dependant on several parameters such as the repartition of the load in the aircraft for example. More preferably, the loading platform **16** is also provided with a loading platform tilt mechanism (not shown) for tilting the loading platform **16** in substantial alignment with the bridge platform **38** of the interface device **36**, and consequently, with the loading level **30** of the aircraft **28**. Thus, the loading platform **16**, the bridge platform **38** and the aircraft level **30** extend at the same attitude, thereby facilitating transfer of loads therebetween. Even more preferably, as illustrated on Figure 13A, each of the loading platform **16** and the bridge platform **38** is respectively provided with means **90** for facilitating displacement of the goods thereon, as well known in the art.

In a still further preferred embodiment of the present invention, the aircraft loader **10** may advantageously have a propulsion means for providing a self-propelled

loader. A diesel engine may be mounted onto the chassis **12**, preferably on the front section thereof. Alternatively, other types of engines, such as gasoline or electric engines may be used for propelling the loader **10**.

Today, for most of the airports, 4 meters is the maximum available height around which airport roads are usually designed. Thus, the aircraft loader **10** preferably has a height of approximately 4 meters when the loading platform **16** and the bridge platform **38** are lowered in order to be usable in these airports. Similarly, for most airports, 12 meters is the maximum turning radius around which airport roads are usually designed for. Thus, in a preferred embodiment of the present aircraft loader **10**, the additional chassis **76** and the connecting device **78** are particularly adapted to provide a turning radius of the aircraft loader of approximately 12 meters.

To provide an even more convenient aircraft loader, according to another aspect of the invention, there is provided an articulated aircraft loader for loading and unloading goods in and out of an aircraft having a loading level. This particular embodiment is advantageous since it provide a compact assembly more manoeuvrable and more transportable in an aircraft, as illustrated in Figures 16A to 17D. Moreover, the installation of the loader next to the aircraft is greatly simplified with regards to the prior art systems which are often time-consuming.

Referring now to Figure 20, the articulated aircraft loader **10** has a main chassis **92** having a front end **94** opposite a rear end **96**. The main chassis **92** is provided with a main loading platform **98** mounted thereon. The main loading platform **98** is moveable between a lower elevation level and an upper elevation level substantially coplanar with the loading level **30** of the aircraft **28**. The articulated aircraft loader **10** also has a rear chassis **100** connectable to the main chassis **92**. The rear chassis **100** has a front end **102** opposite a rear end **104**. The rear

chassis **100** is provided with a rear loading platform **106** moveable between a lowermost elevation level and a second elevation level comprised between the lower and upper elevation levels for allowing transfer of goods between the main and rear platforms **98**, **106** when the platforms **98**, **106** extend at a same level. The articulated aircraft loader **10** is also provided with articulated connecting means **108** operatively connected to each of the main chassis **92** and the rear chassis **100** for articularly connecting the rear chassis **100** to the main chassis **92**. The articulated aircraft loader **10** also has straightening means operatively connected to the rear chassis **100** for straightening the rear chassis **100** in longitudinal alignment with the main chassis **92**. In other words, in operation, the articulated aircraft loader **10** is moved closed to the aircraft for docking the main platform **98** to the aircraft level. With the systems of the prior art, several back and forward movements have to be made in order to bring the bulky loader in a correct alignment with the aircraft level since the available area on the tarmac is relatively limited, specially for big airplanes. These movements are time consuming. On the contrary, with the present invention, the main platform **98** is first aligned with the aircraft level. Once it has been done, the straightening means is activated to pivot the rear chassis **100** and its rear platform **106** in alignment with the main platform **98**. This is particularly advantageous with respect to the prior art system, since the aircraft loader is easily and quickly installed without requiring extra labor time. Moreover, when the aircraft has been loaded, thanks to the straightening means, the rear chassis **100** can advantageously be pivoted again in its initial position to be easily driven away of the aircraft area without requiring extra manoeuvres.

In a preferred embodiment which is illustrated on Figure 20, preferably, the straightening means has a motorised wheel **110** substantially transversally mounted under the rear chassis **100**. More preferably, the straightening means further has a non-motorised wheel **112** substantially transversally mounted under the rear chassis **100**. In this case, each of the wheels **110**, **112** advantageously

extends distal from each other on a arc of circle whose center extends at the connecting means **108**. Also preferably, each of the wheels **110**, **112** is oriented on this arc of circle. The motorised wheel **110** has a neutral position wherein the wheel is inactive. In this position, the aircraft loader **10** can be driven on the tarmac as usual. The motorised wheel **110** also has an operative position wherein the rear chassis **100** is sat on the motorised wheel **110** and also preferably on the non-motorised wheel **112**. It is well known in the art that the chassis can be lowered with respect to its conventional wheels. Thus, in the operative position, the rear chassis **100** in lowered until its weight rests on the transversal wheels **110**, **112**. When the motorised wheel **110** is in the operative position, an operation thereof allows to pivot the rear chassis **100** with respect to the main chassis **92** around the articulated connecting means **108**.

As illustrated on Figure 20 and also on Figure 1, preferably, the articulated connecting means **108** have a first connecting device mounted on the rear end 96 of the main chassis **92** and a second connecting device mounted on the front end **102** of the rear chassis **100**. Each of the first and second connecting devices cooperates with each other. More preferably, the articulated connecting means **108** is adapted to provide a three-axis connection between each of the main and rear chassis **92**, **100**. This articulated connecting means **108** won't be described further since it is well known in the art. Indeed, any convenient means known in the art and providing this three-axis connexion could advantageously be used.

As described above, the articulated aircraft loader **10** of the present invention also further advantageously has a platforms coupling means for removably coupling the main platform **98** and the rear platform **106** together when both platforms **98**, **106** extend at a same level. The coupling means preferably has a first coupling device mounted on the main platform **98** and a second coupling device mounted on the rear platform **106**, each of the first and second coupling means cooperating

with each other when both platforms **98, 106** extend at the same level.

However, before coupling the platforms together, the attitude of each platform has to be monitored and corrected if necessary in order to prevent that the platforms knock together. This could arise when the ground is slightly inclined or when the aircraft level is inclined too.

To facilitate the alignment, the main loading platform is advantageously further provided with a main tilt mechanism (not shown) for tilting the main loading platform 98 in substantial alignment with the loading level of the aircraft. More advantageously, the rear loading platform **106** is also provided with a rear tilt mechanism for tilting the rear loading platform **106** in substantial alignment with the main loading platform **98**. Thus, the level of the main platform **98** is firstly aligned with the level of the aircraft. Then, the level of the rear platform **106** is aligned with the level of the main platform **98**. To facilitate the alignment, each of the main and rear chassis **92, 100** is advantageously respectively provided with lowerable stabilizing legs **114** projecting under the respective one of the chassis **92, 100**. Preferably, each of these legs **114** can be independently controlled. To even more facilitate the alignment of each platform with respect to each other, the articulated aircraft loader **10** is advantageously further provided with an attitude monitoring means (not shown) mounted on one of the main and rear chassis **92, 100** for monitoring attitude of each of the platforms **98, 106**. The attitude monitoring means can be provided with a plurality of proximity detectors particularly arranged. Others arrangements using light transmitters and light receivers particularly combined could also advantageously be used. With this particularly advantageous preferred embodiment, a correction of the attitude of each platform **98, 106** in each axis can be done in a simple and automatic manner.

In another further preferred embodiment, as illustrated on Figure 20, the front end **102** of the rear chassis **100** is adapted to move under the rear end **96** of the front chassis **92** when the articulated aircraft loader **10** rotatively move forwards. This arrangement allows to provide an even more compact assembly.

As explained above, in order to meet the dimension constraints imposed by the usual configuration of most airports, the connecting device is particularly adapted to provide a turning radius of the articulated aircraft loader of approximately 12 meters.

Also, as already mentioned above, in a still further preferred embodiment of the present invention, the articulated aircraft loader **10** may advantageously have a propulsion means for providing a self-propelled loader. A diesel engine may be mounted onto the chassis **92**, preferably on the front section **94** thereof. Alternatively, other types of engines, such as gasoline or electric engines may be used for propelling the loader **10**.

As it can be understood upon reading of the description of the present invention, the articulated loader of the present invention is particularly efficient for loading the upper deck of an aircraft in an easy, efficient and cost effective manner.

Although preferred embodiments of the present invention have been described in detail herein and illustrated in the accompanying drawings, it is to be understood that the invention is not limited to these precise embodiments and that various changes and modifications may be effected therein without departing from the scope or spirit of the present invention.

WHAT IS CLAIMED IS:

1. An aircraft loader for loading and unloading goods in and out of an aircraft having a loading level, said loader comprising:

a main chassis;

a loading platform mounted on the chassis and moveable between a lower elevation level and an upper elevation level substantially coplanar with the loading level of the aircraft, the loading platform having a loading end opposite an unloading end and two side edges;

an interface device mounted on the chassis for interfacing the unloading end of the loading platform with the loading level of the aircraft, said interface device comprising:

a bridge platform moveable between a base elevation level and said upper elevation level, said bridge platform having a loading end opposite an unloading end and two side edges, said bridge platform further having a transfer portion extending between the ends thereof, said loading end of said bridge platform extending in adjacent alignment along the unloading end of the loading platform when both platforms extend at the upper level for providing a goods path between the loading platform and the loading level of the aircraft through said transfer portion ; and

retractable handrails mounted along a respective one of said ends of said bridge platform, said retractable handrails having an extended position wherein said handrails are raised above the upper elevation level across the goods path for blocking passage of said goods between said loading level of said aircraft and said loading platform, and a retracted position wherein said handrails are moved away from the goods path when both platforms extend at the upper elevation level for allowing passage of said goods between said loading level of said aircraft and said loading platform;

a lifting device for raising and lowering each of the loading platform and the bridge platform between their respective elevation levels; and

control means for controlling operation of said lifting device.

2. The aircraft loader according to claim 1, wherein said interface device further comprises a handrails retracting mechanism operatively connected to said handrails for operating said handrails between each of said extended and retracted positions.

3. The aircraft loader according to claim 2, wherein said handrails retracting mechanism comprises a weight-and-pulley device for vertically lowering said handrails below the upper elevation level when each of the platforms extends at said upper elevation level.

4. The aircraft loader according to claim 2, wherein said handrails retracting mechanism comprises a pivot device for pivoting said handrails below the upper elevation level when each of the platforms extends at said upper elevation level.

5. The aircraft loader according to claim 2, wherein said handrails retracting mechanism is responsive to a movement of said loading platform.

6. The aircraft loader according to claim 1, wherein said retractable handrails are mounted along the loading end of said bridge platform.

7. The aircraft loader according to claim 1, wherein said bridge platform further has an operating portion extending in adjacent relationship sideways to said transfer portion, said control means being provided with a control station mounted on the operating portion of said bridge platform for operating each of said platforms.

8. The aircraft loader according to claim 7, wherein said bridge platform is further provided with a ladder attached to said operating portion for providing a safe emergency path accessible from said operating portion.

9. The aircraft loader according to claim 8, wherein said ladder is a telescopic ladder.

10. The aircraft loader according to claim 7, wherein said operating portion of said bridge platform has operating portion handrails surrounding said operating portion.

11. The aircraft loader according to claim 1, further comprising a platforms coupling means for removably coupling said loading platform and said bridge platform together when both platforms extend at a same level.

12. The aircraft loader according to claim 11, wherein said coupling means comprise a first coupling device mounted on said loading platform and a second coupling device mounted on said bridge platform, each of said first and second coupling means cooperating with each other when both platforms extend at the same level.

13. The aircraft loader according to claim 12, wherein said lifting device comprises a scissor-type mechanism operatively connected between said chassis and said loading platform.

14. The aircraft loader according to claim 13, wherein said lifting device further comprises a telescopic support mechanism operatively connected between said chassis and said interface device for supporting said interface device when said interface device is raised.

15. The aircraft loader according to claim 1, further comprising a propulsion means for propelling said loader.

16. The aircraft loader according to claim 1, wherein said interface device is further provided with an interface device tilt mechanism for tilting the bridge platform in substantial alignment with the loading level of the aircraft.

17. The aircraft loader according to claim 1, wherein said loading platform is further provided with a loading platform tilt mechanism for tilting the loading platform in substantial alignment with the bridge platform of the interface device.

18. The aircraft loader according to claim 1, wherein said loading platform has side handrails extending on each side thereof.

19. The aircraft loader according to claim 1, wherein said bridge platform has side handrails extending on each side thereof.

20. The aircraft loader according to claim 1, wherein said bridge platform is further provided with a retractable door extension extending on a respective one of said side edges of said bridge platform.

21. The aircraft loader according to claim 1, wherein said upper elevation level is comprised between 8 and 10 meters.

22. The aircraft loader according to claim 1, wherein said loader has a height of approximately 4 meters when the loading platform and the bridge platform are lowered.

23. The aircraft loader according to claim 1, wherein each of said loading platform and said bridge platform is respectively provided with means for facilitating displacement of said goods thereon.

24. The aircraft loader according to claim 1, further comprising lowerable stabilizing legs projecting under the main chassis.

25. The aircraft loader according to claim 1, wherein said goods comprises containers, the loading platform having a length adapted to provide support for two containers.

26. The aircraft loader according to claim 1, further comprising:

an additional chassis connectable to the main chassis;

a connecting device mounted on the main chassis proximate the loading end of the loading platform for pivotally connecting the additional chassis to the main chassis;

an additional platform mounted on the additional chassis and moveable between a first elevation level and a second elevation level, the second level being comprised between the lower and upper elevation levels for allowing transfer of said goods between the additional platform and the loading platform when both the loading platform and the additional platform extend at a same level; and

an additional lifting device for raising and lowering the additional platform between the first elevation level and the second elevation level.

27. The aircraft loader according to claim 26, wherein said second elevation level extends at the lower elevation level.

28. The aircraft loader according to claim 26, wherein said control means control

operation of said additional lifting device.

29. The aircraft loader according to claim 26, wherein said additional lifting device comprises a scissor-type mechanism.

30. The aircraft loader according to claim 26, wherein said additional chassis and said connecting device are particularly adapted to provide a turning radius of said aircraft loader of approximately 12 meters.

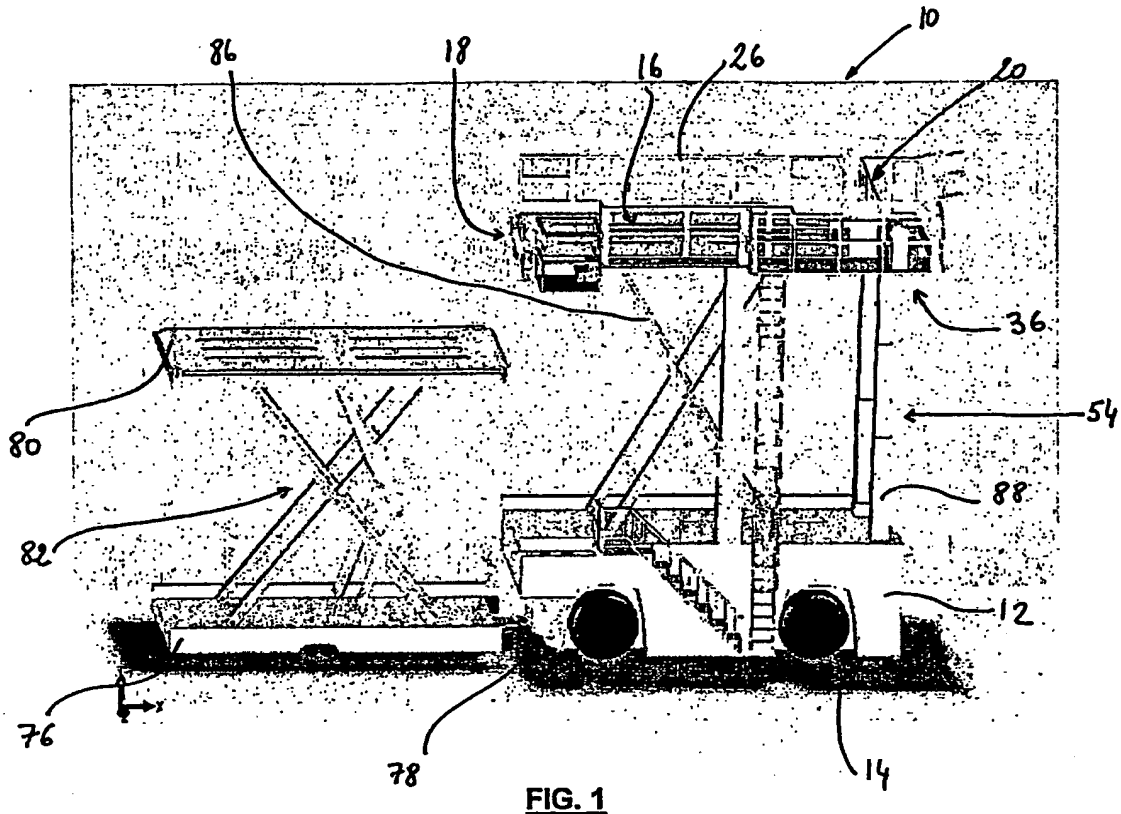


FIG. 1

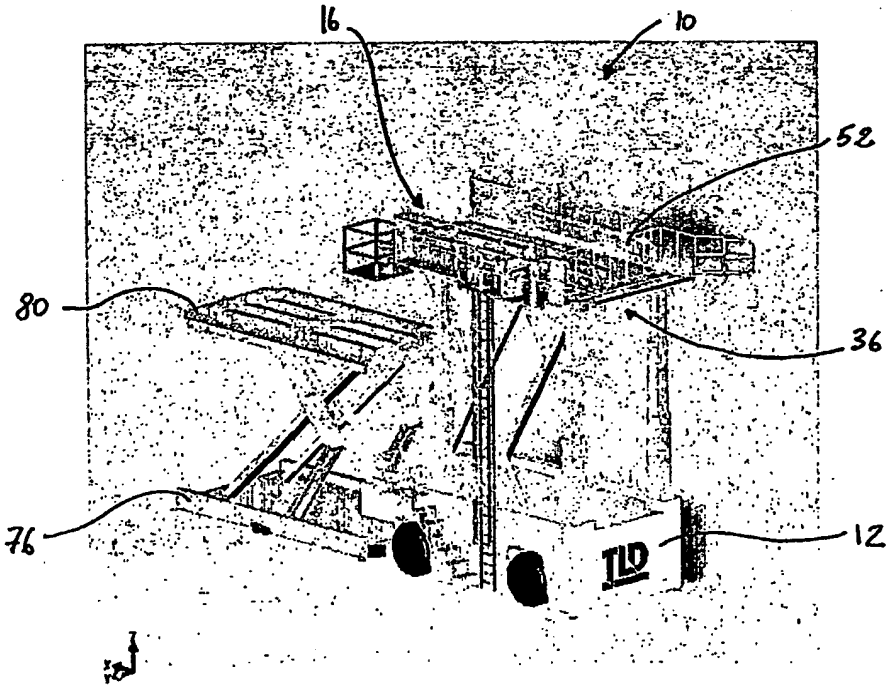


FIG. 2

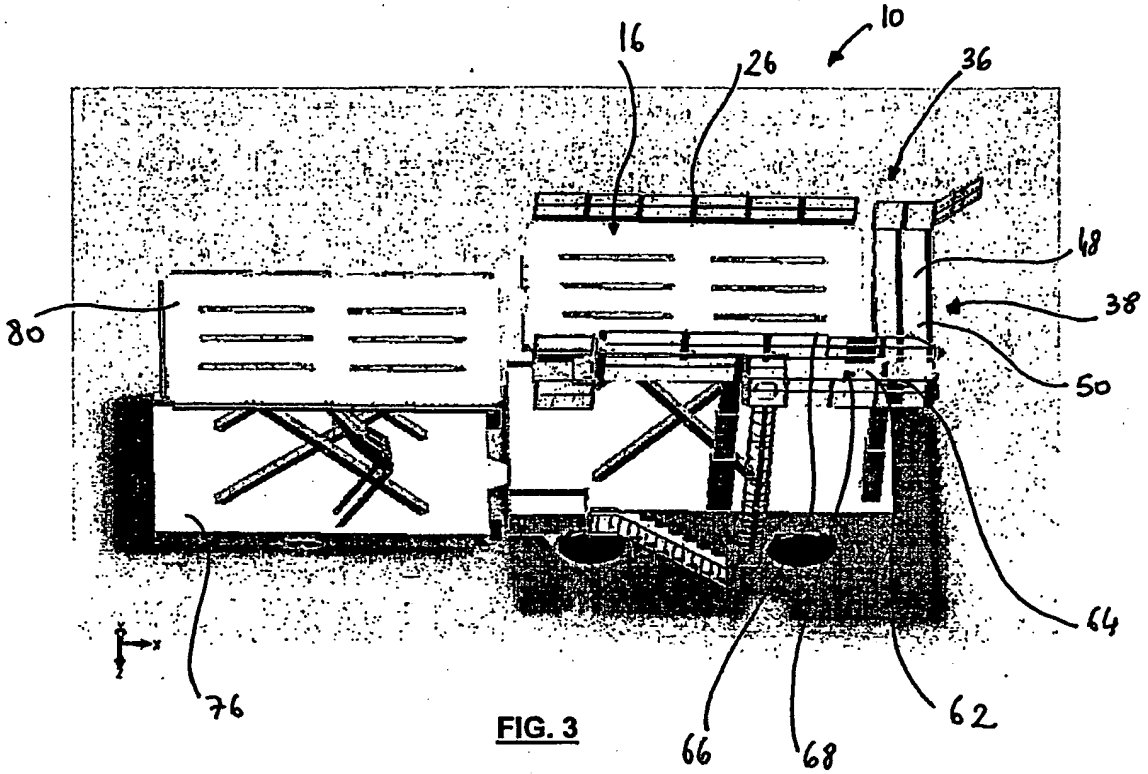


FIG. 3

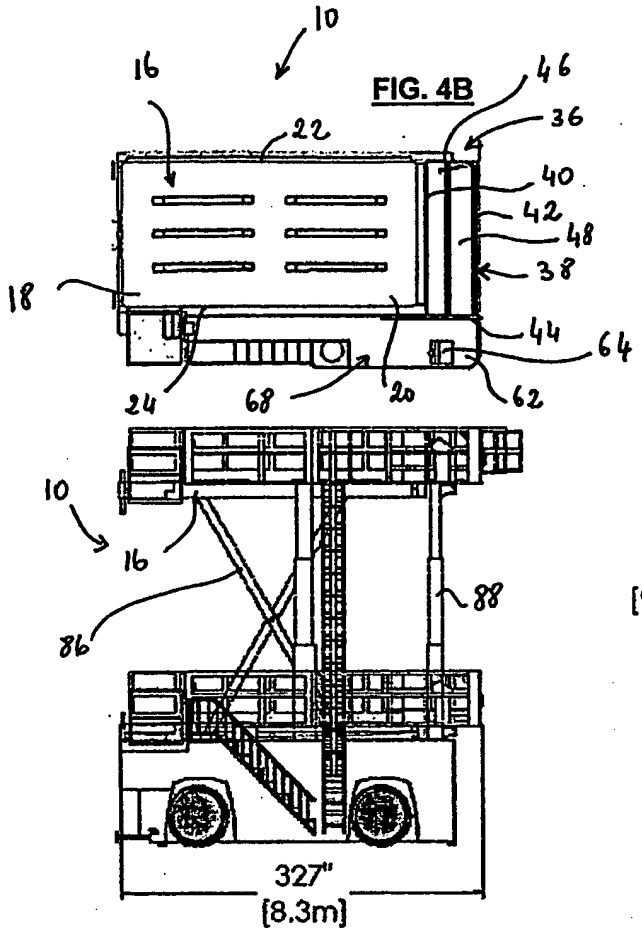


FIG. 4A

FIG. 4B

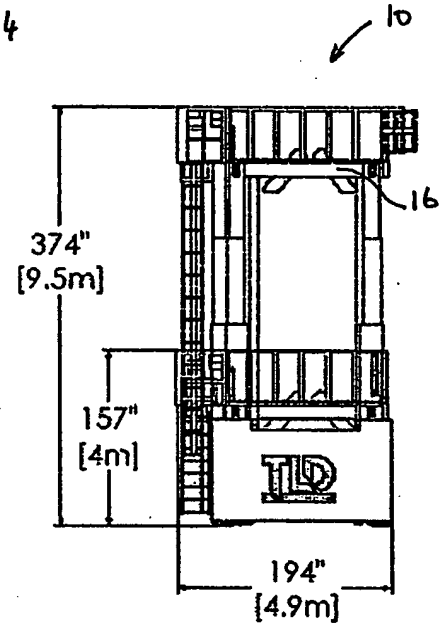
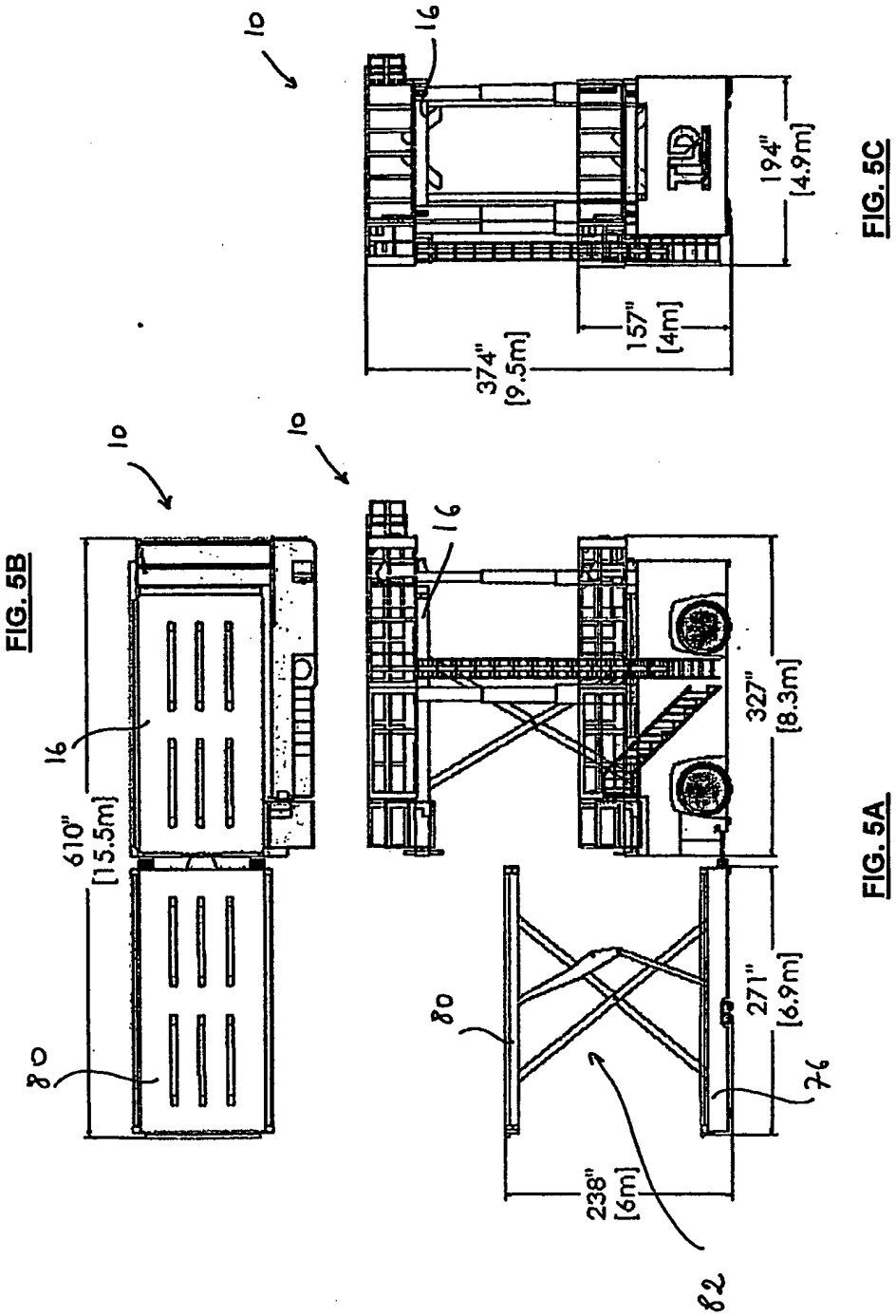


FIG. 4C


10
16
194"
[4.9m]
157"
[4m]
374"
[9.5m]
FIG. 5C
10
10
16
327"
[8.3m]
16
610"
[15.5m]
80
271"
[6.9m]
80
76
238"
[6m]
82
FIG. 5B
FIG. 5A

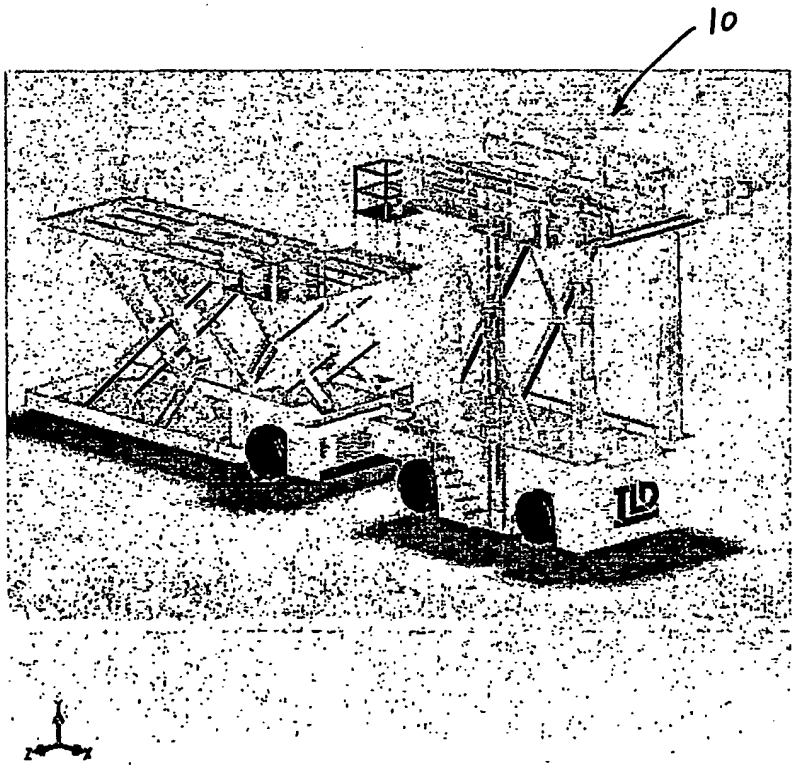


FIG. 6

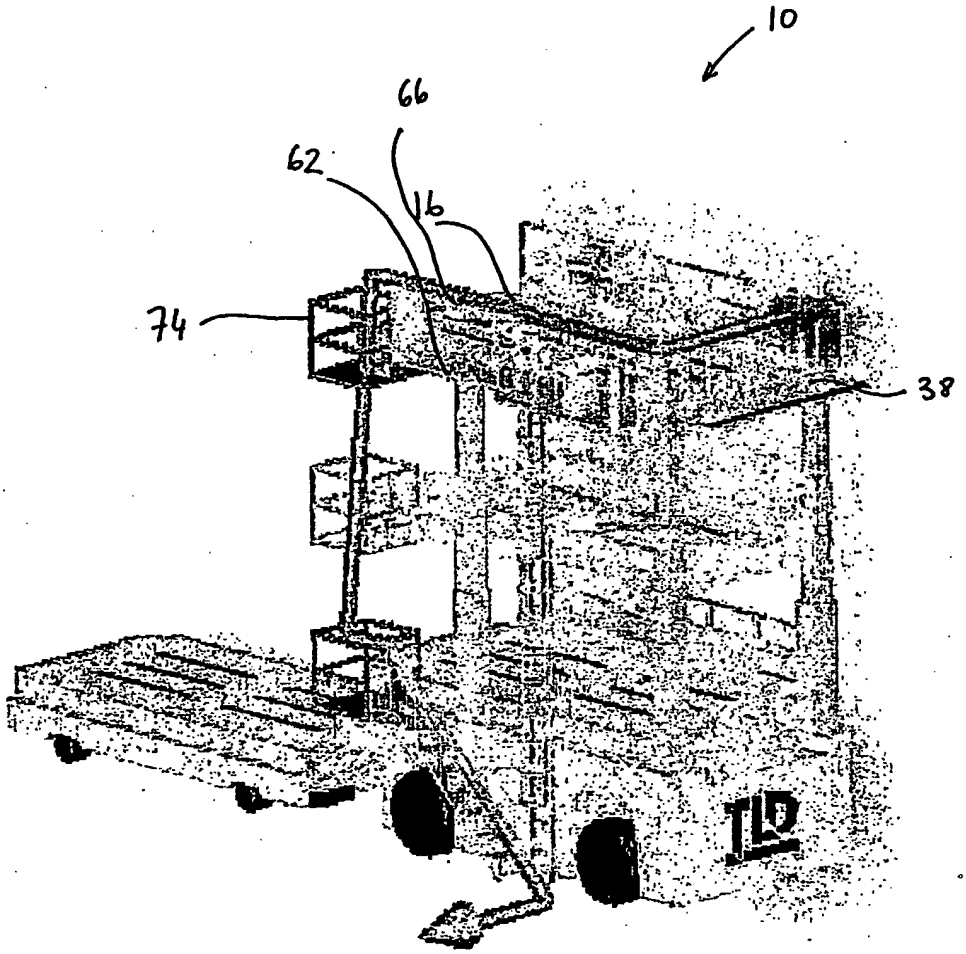


FIG. 7

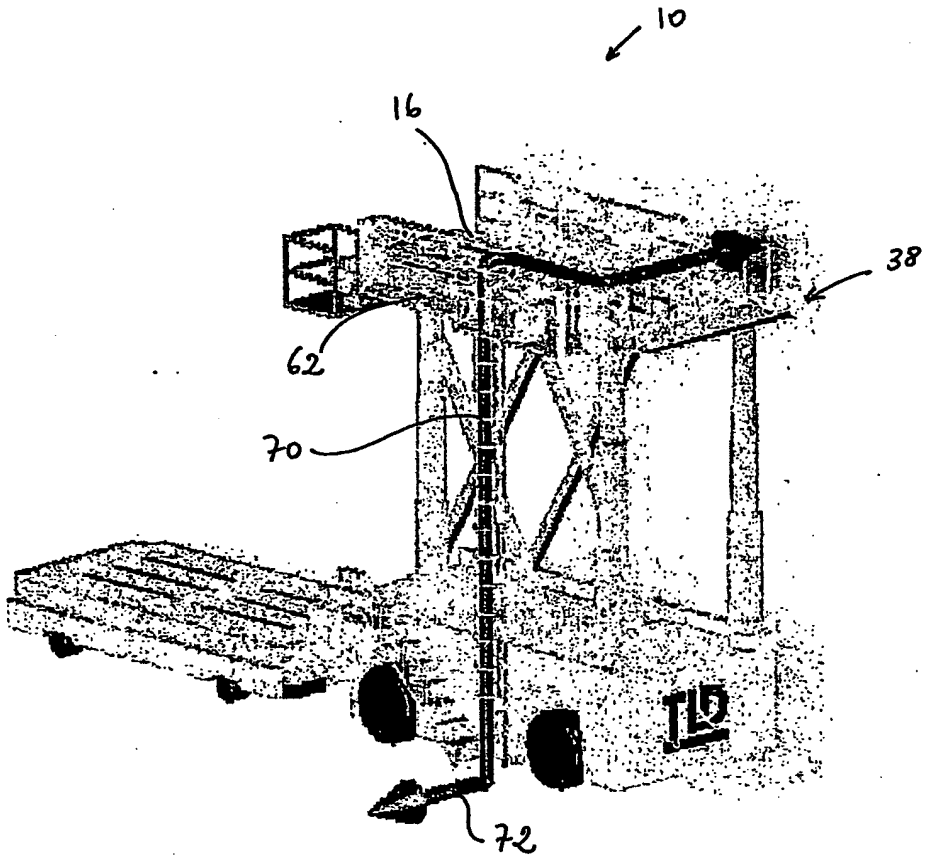


FIG. 8

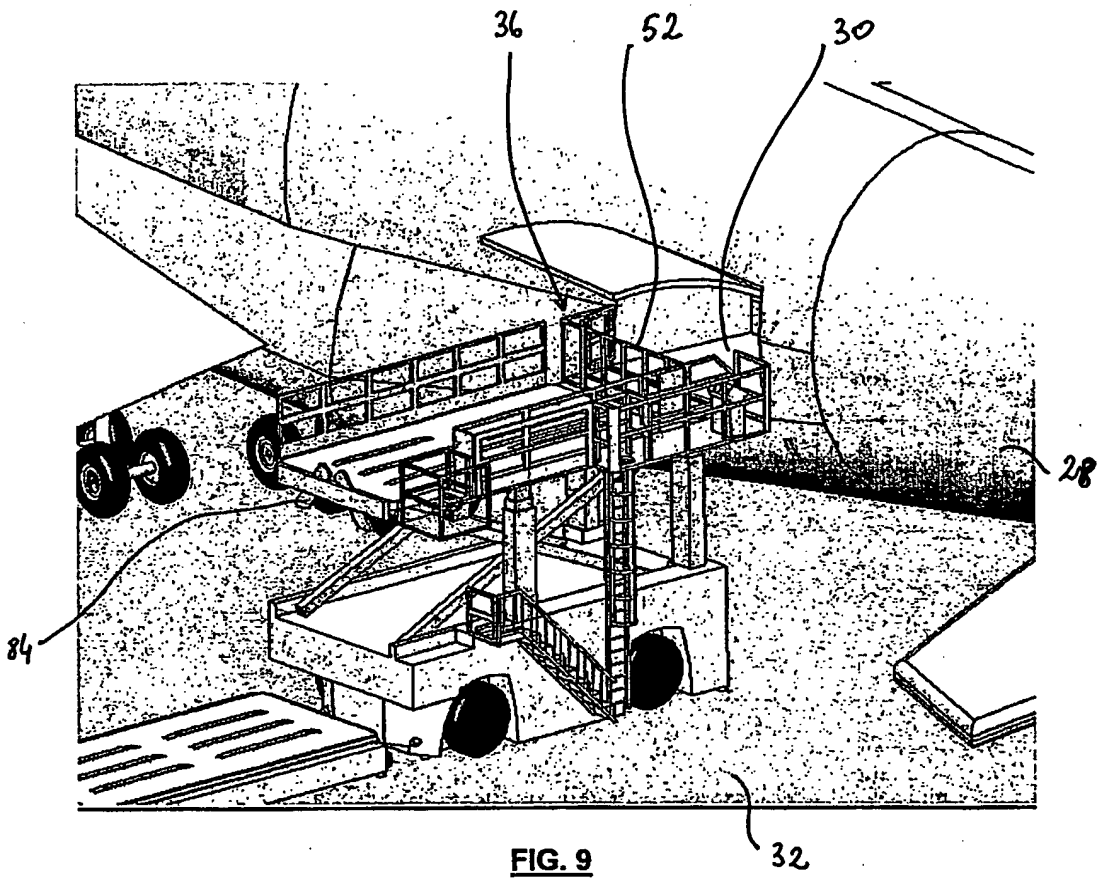


FIG. 9

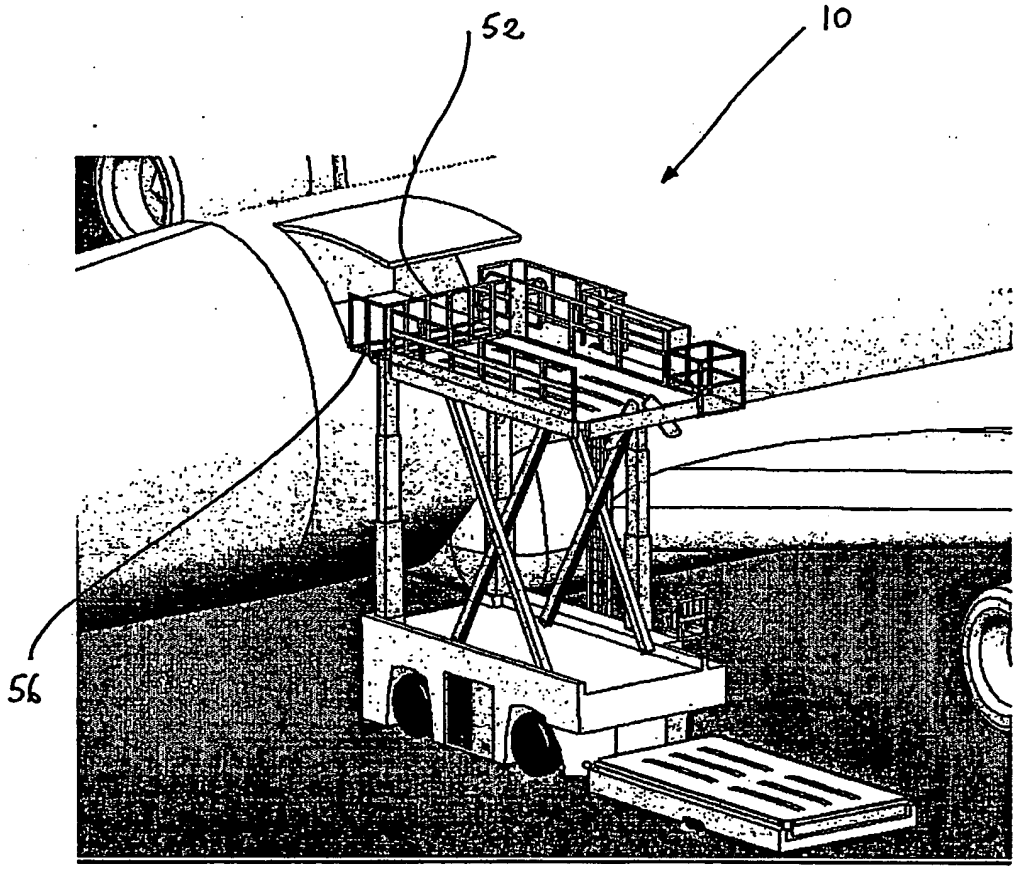


FIG. 10

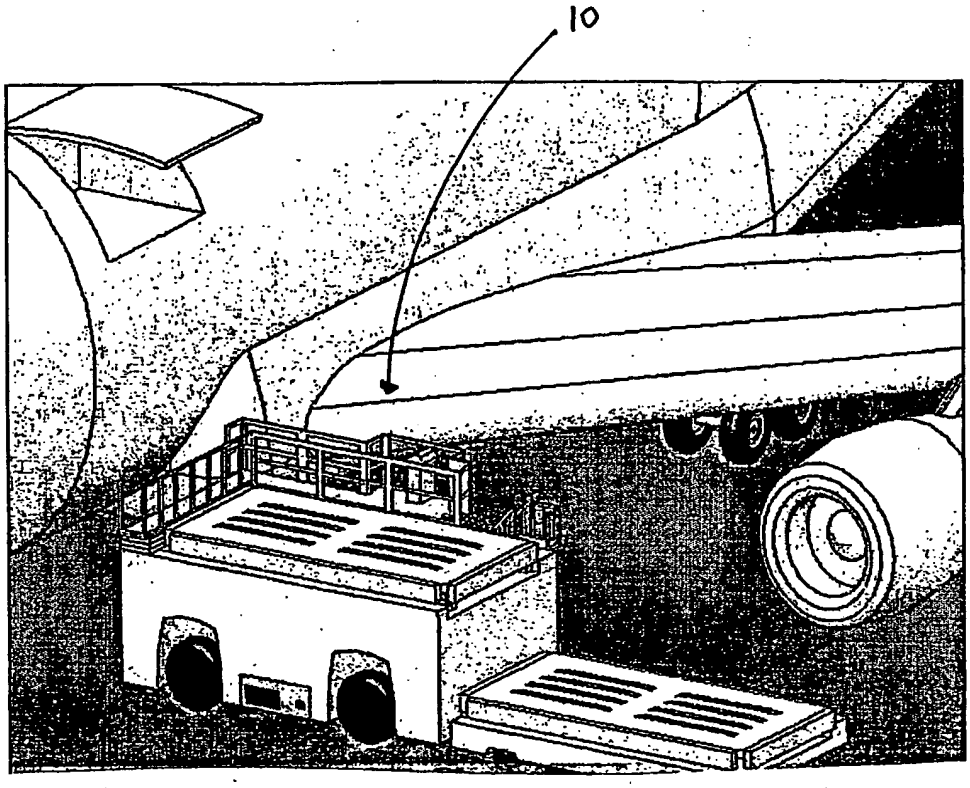


FIG. 11

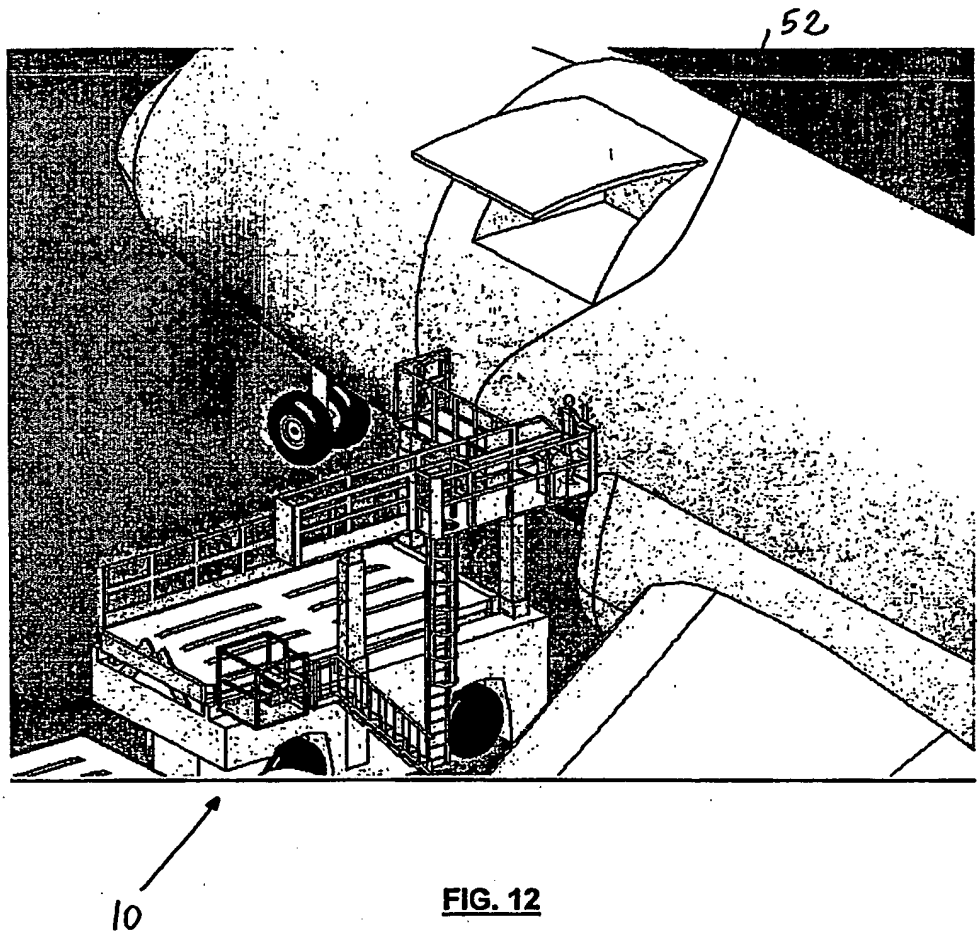


FIG. 12

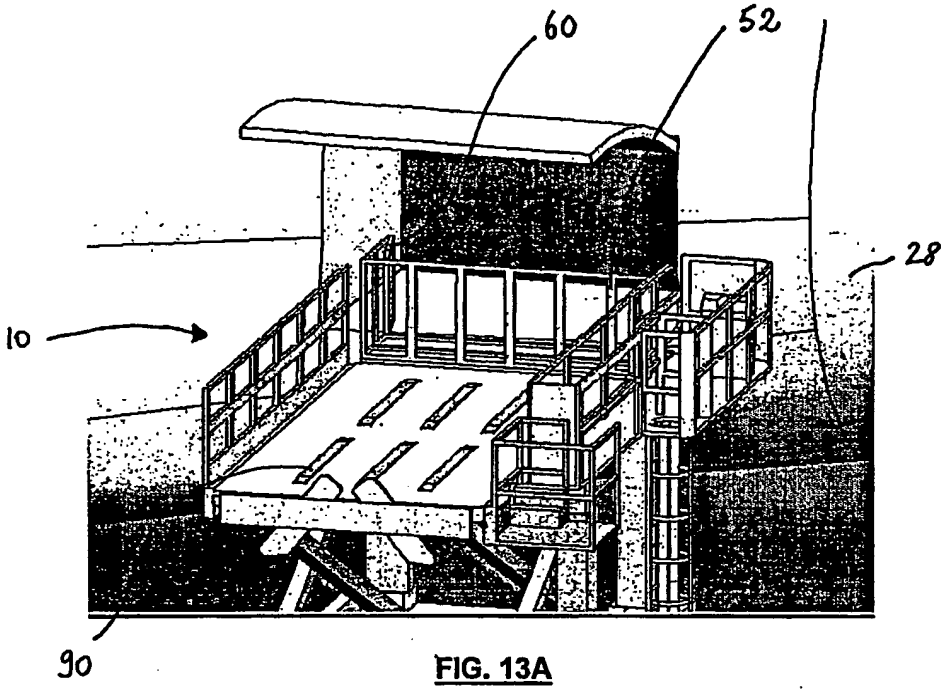


FIG. 13A

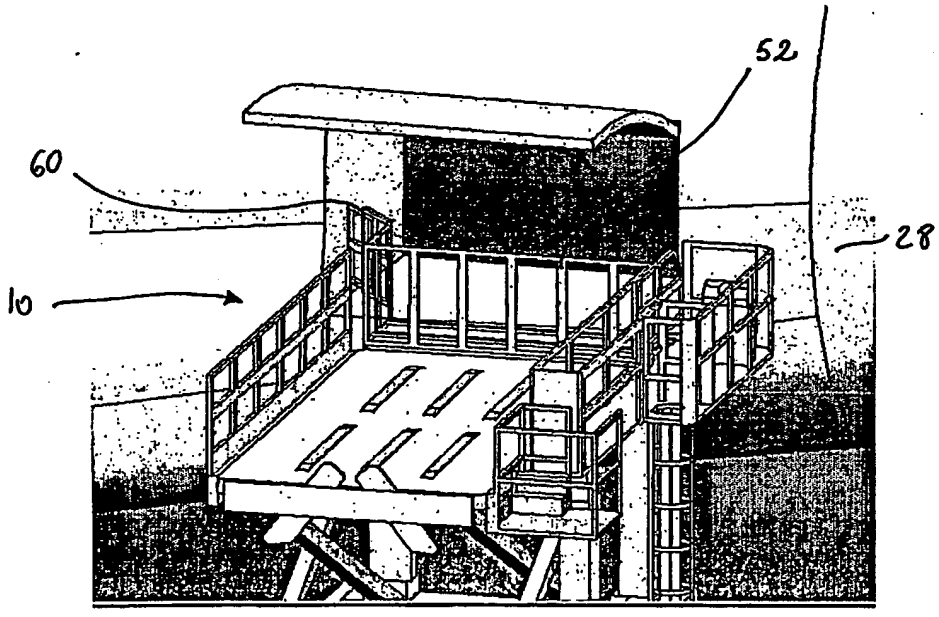


FIG. 13B

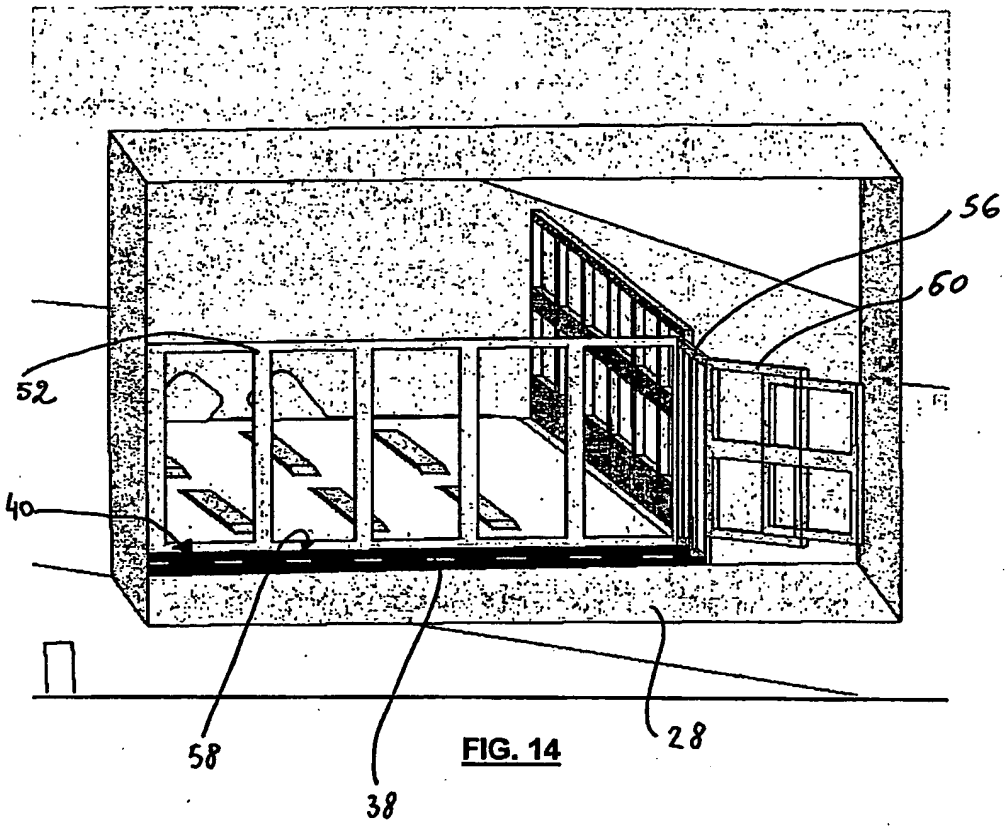


FIG. 14

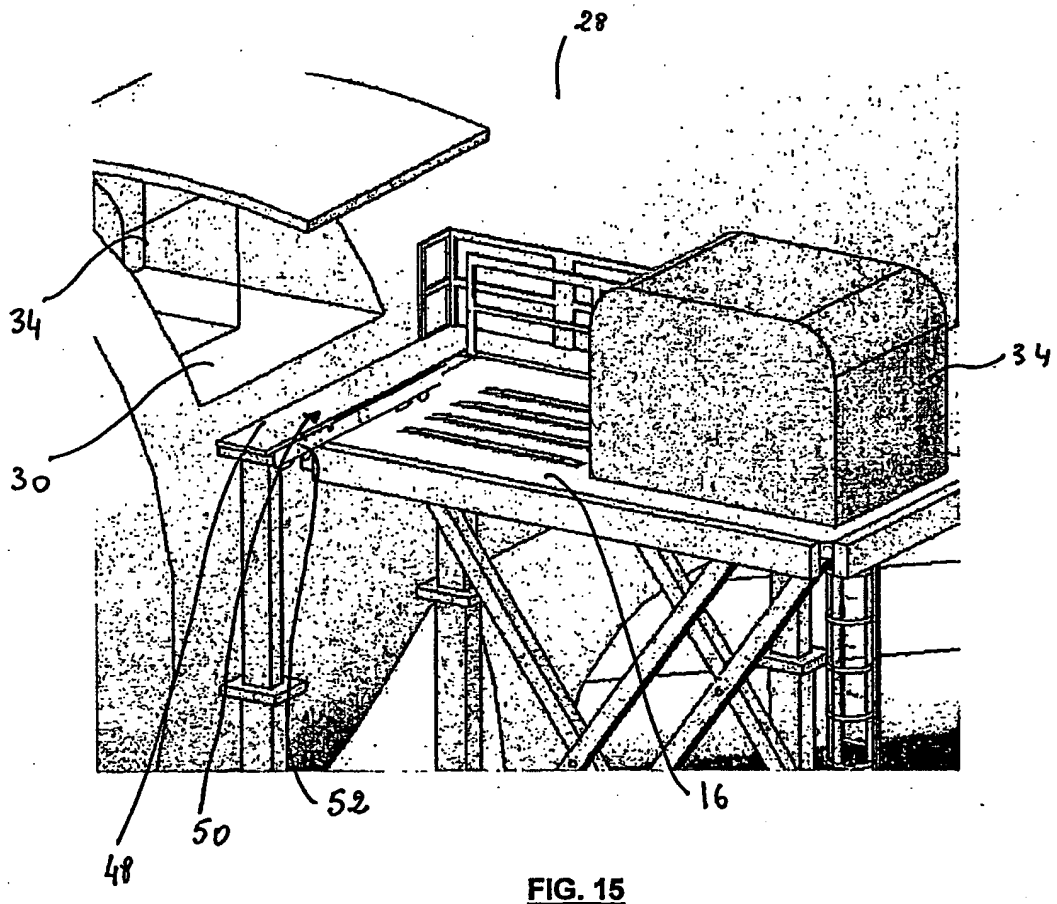


FIG. 15

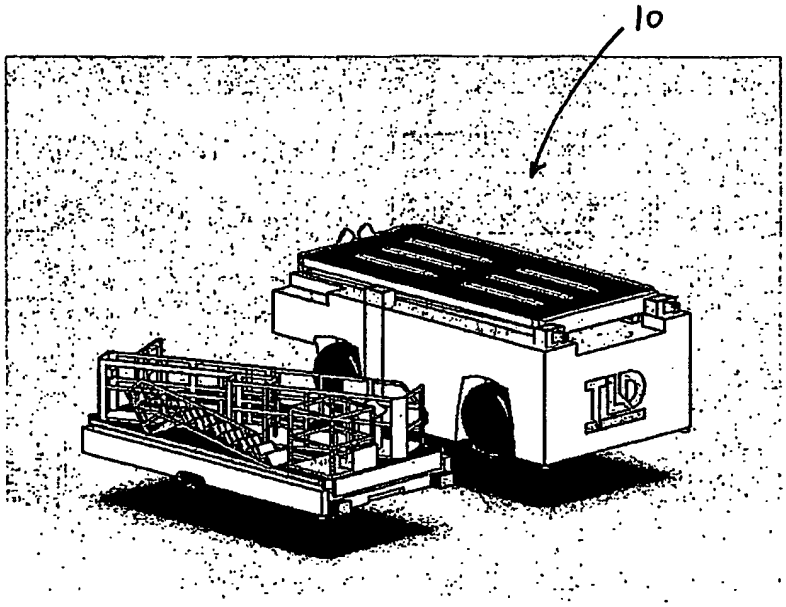


FIG. 16A

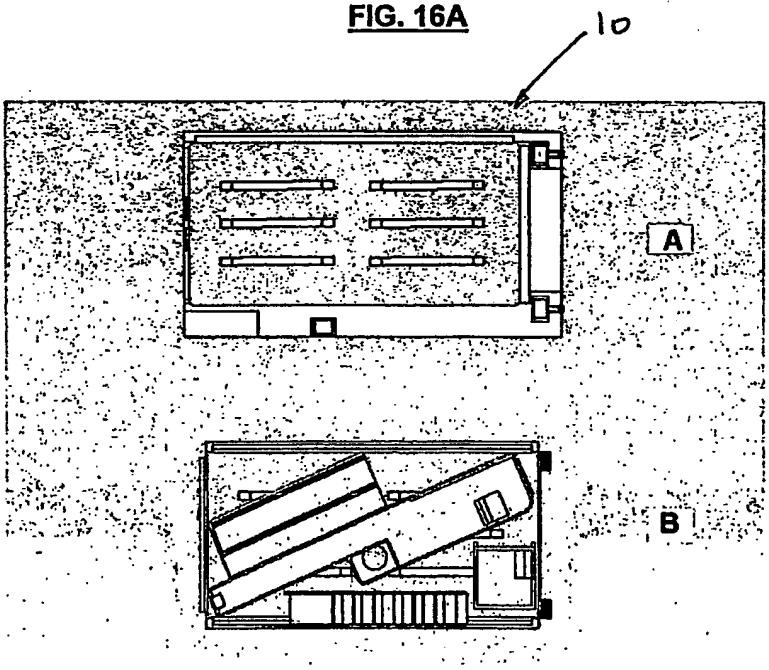


FIG. 16B

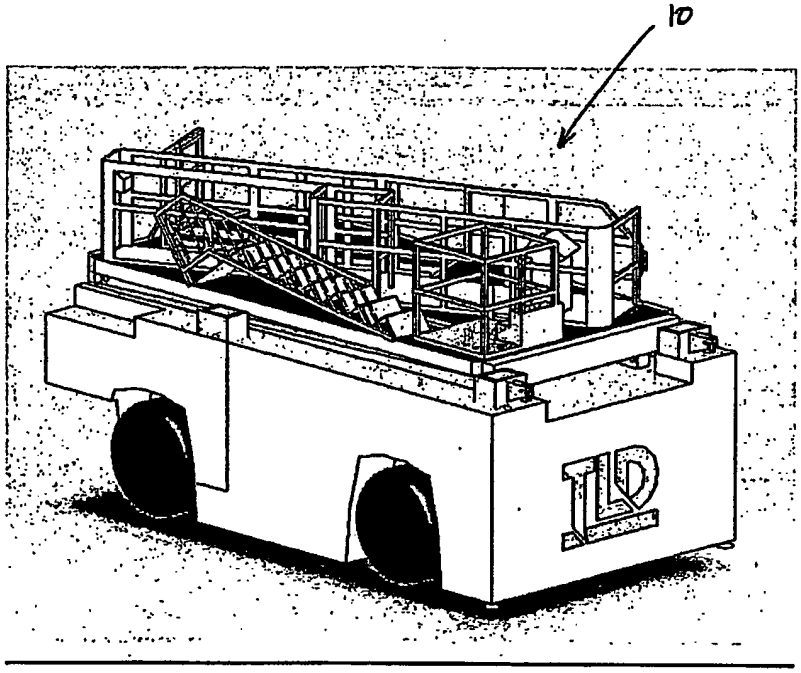


FIG. 16C

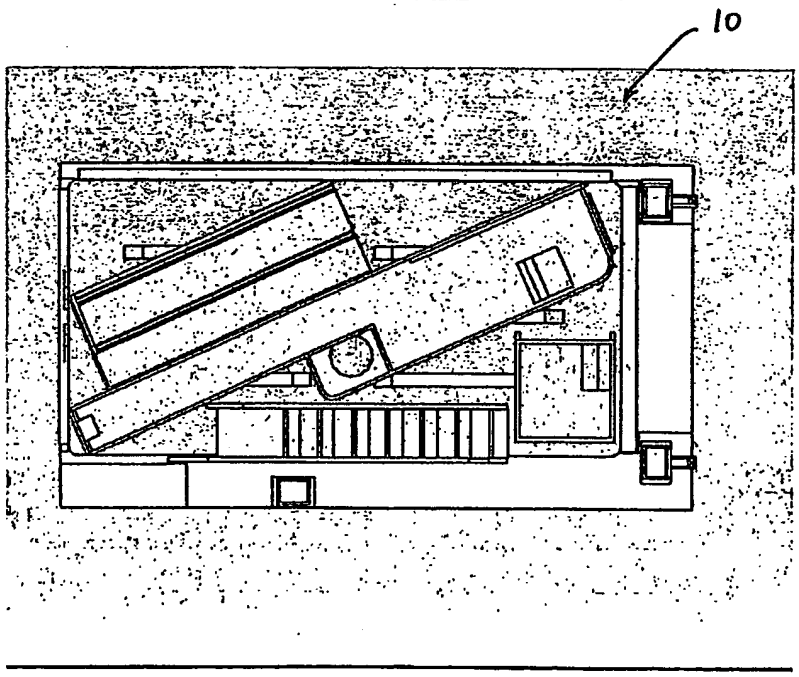


FIG. 16D

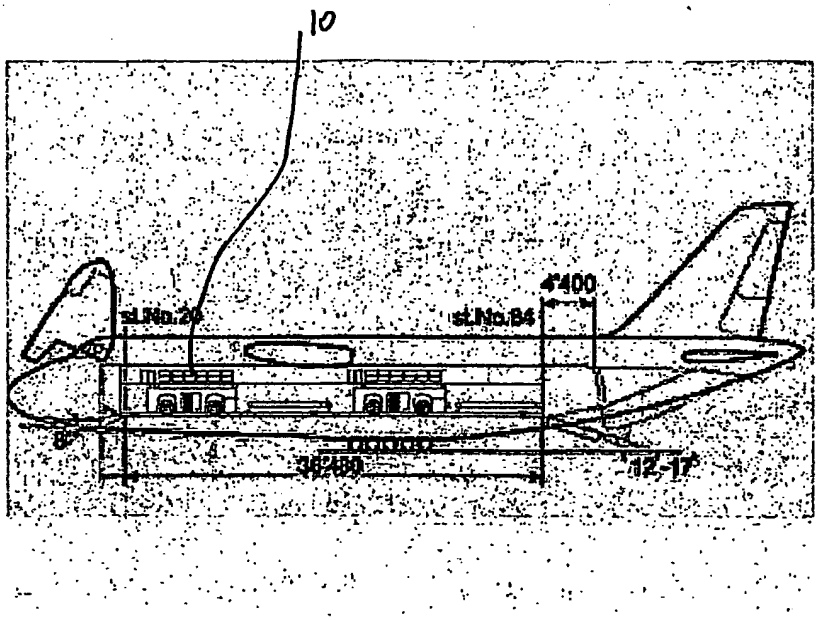


FIG. 17A

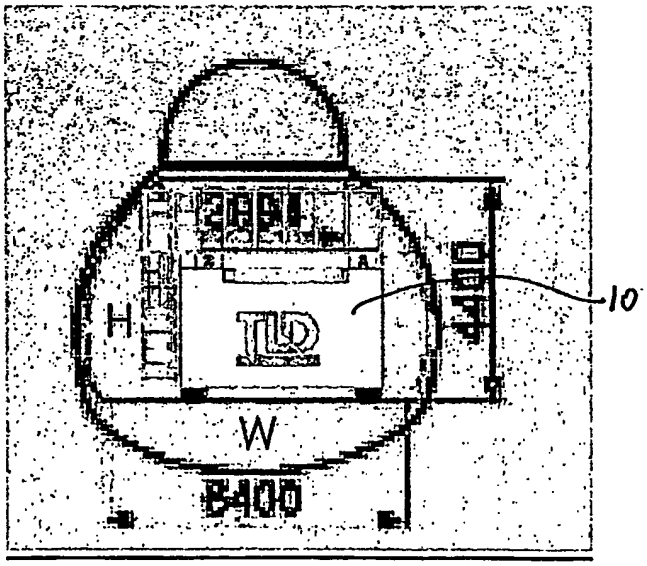


FIG. 17B

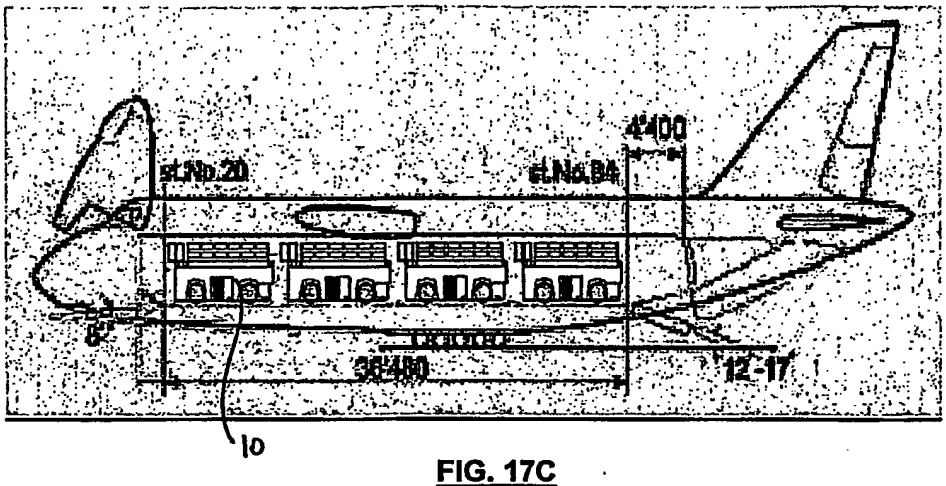


FIG. 17C

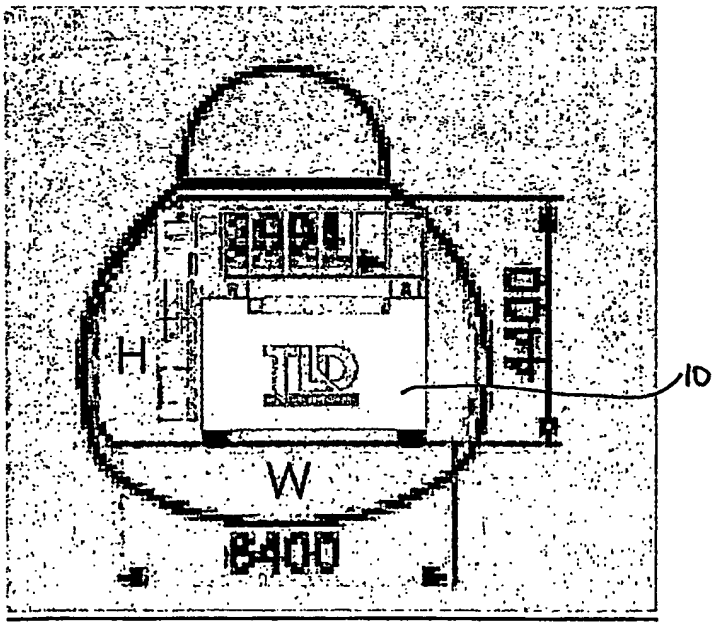


FIG. 17D

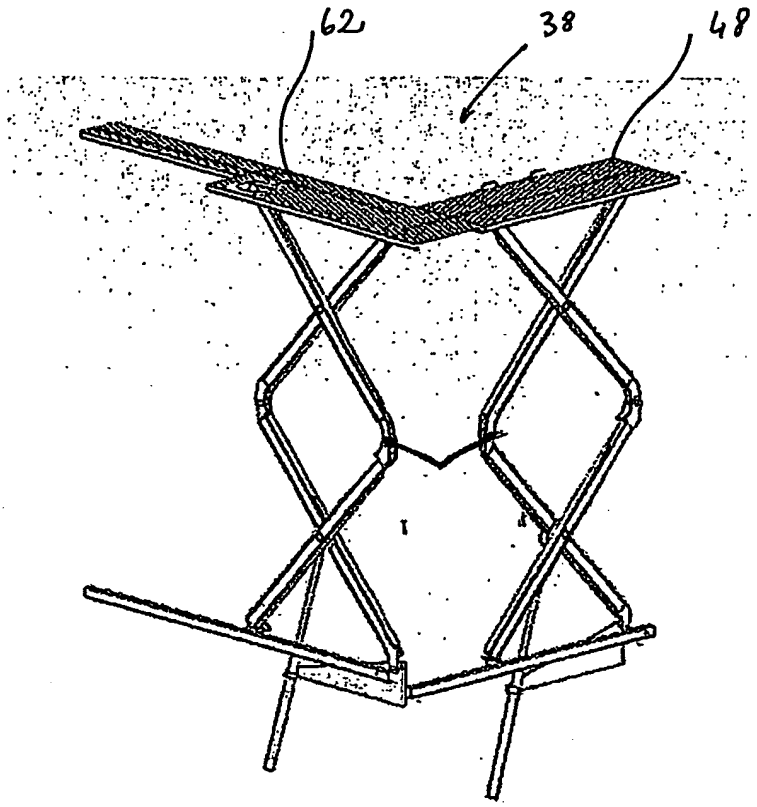


FIG. 18

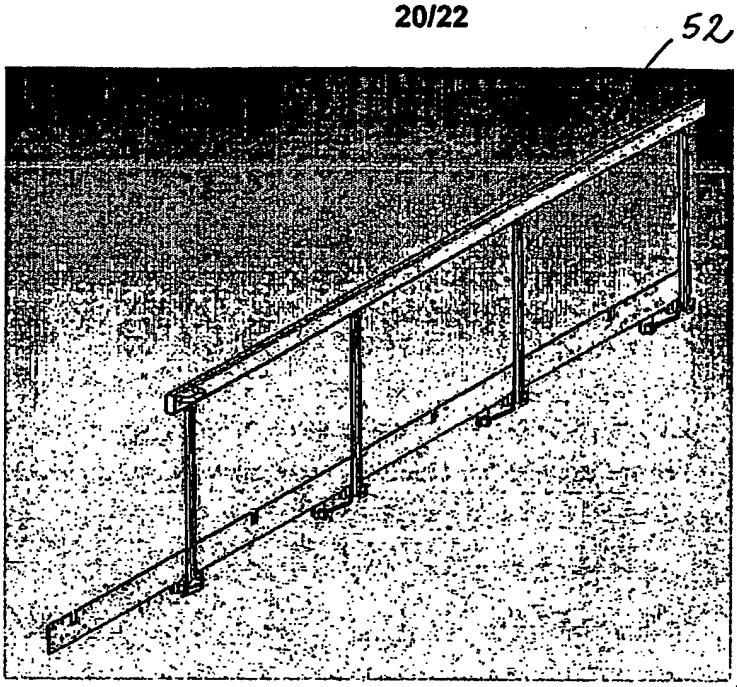


FIG. 19A

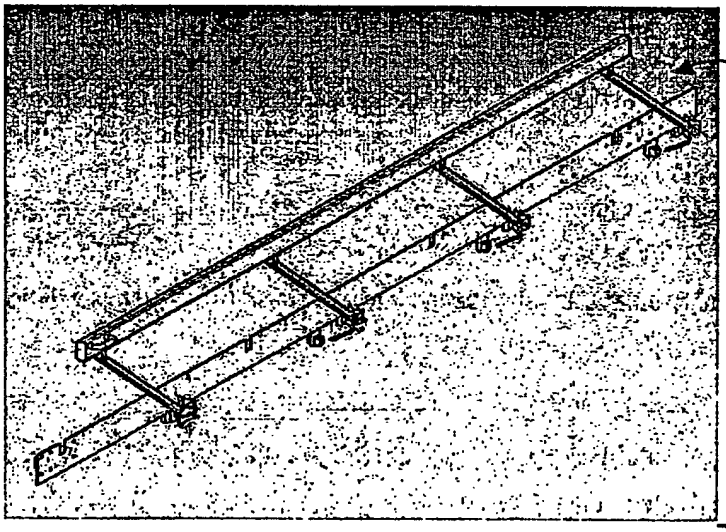


FIG. 19B

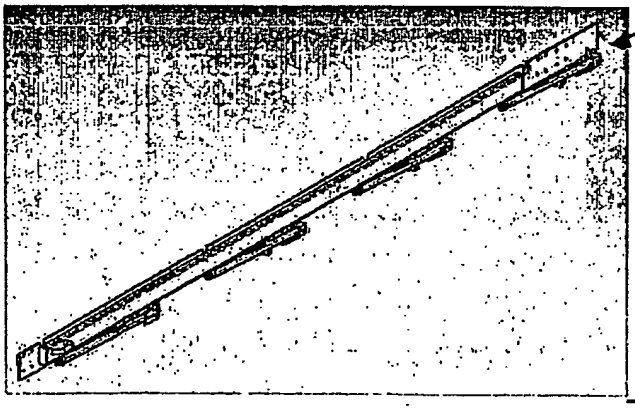


FIG. 19C

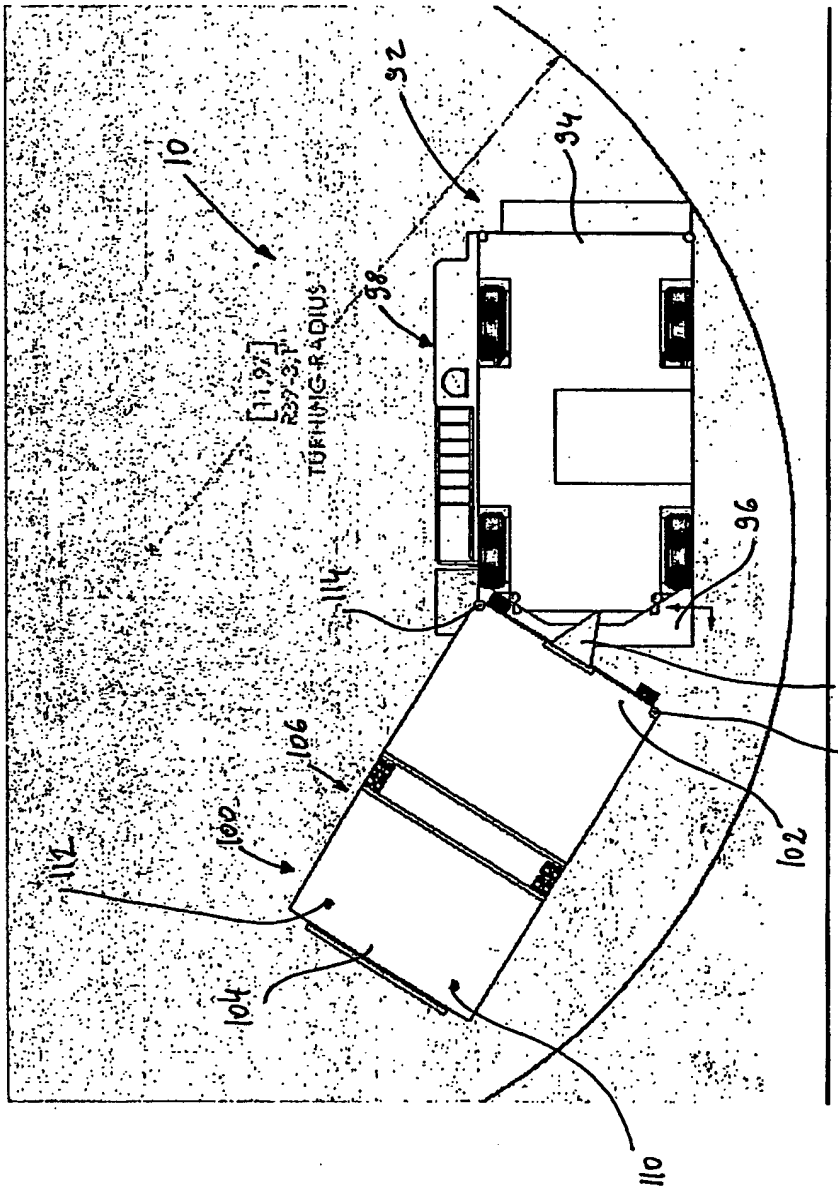

10
92
94
98
TURNING RADIUS
[11.9']
R3.7
96
114
108
114
106
100
102
112
104
110

FIG. 20

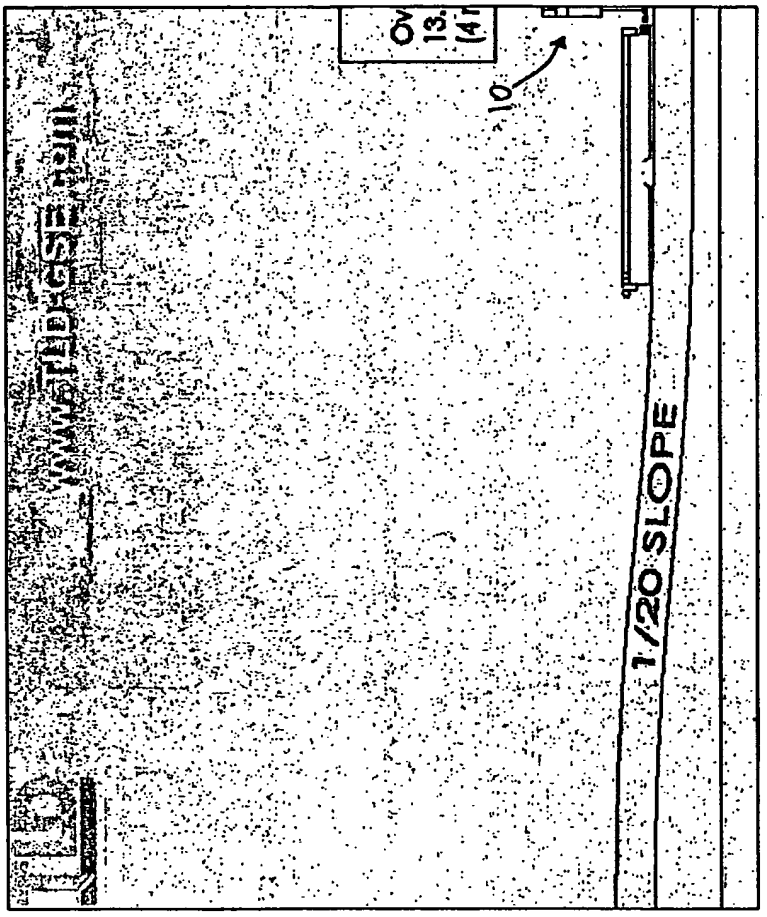


FIG. 21

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2005/001905

A. CLASSIFICATION OF SUBJECT MATTER

IPC: ***B64F 1/32*** (2006.01), ***B66F 9/06*** (2006.01), ***B64F 1/00*** (2006.01), ***B60P 1/02*** (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: ***B64F 1/32*** (2006.01), ***B66F 9/06*** (2006.01), ***B64F 1/00*** (2006.01), ***B60P 1/02*** (2006.01)

CPC: 201/18, 214, 244/91, 214/115, 298

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms used)

Database: Delphion, EspaceNet, Canadian Patent Database

Keywords: aircraft, bridge, chassis, control, handrail, interface, lift, loader, platform, retractable

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 3263832 B (WILLIAMS et al.) 02 August 1966 (02-08-1966) Description, column 6, line 48, to column 9, line 65; Figure 13.	1, 6, 7, 8, 11, 12, 15, 18, 19, 21, 22, 23, 24, 25
Y	US 3687321 B (GOODHART et al.) 29 August 1972 (29-08-1972) Whole Document.	1, 6, 7, 8, 11, 12, 13, 15, 18, 19, 21, 22, 25
Y	US 3126 112 B (SHAW et al.) 24 March 1964 (24-03-1964) Description, column 2, line 3, to column 3, line 70; Figures 1 and 3.	1, 6, 11, 12, 15, 18, 19, 21, 22, 25
Y	US 159 571 B (FUSCHLOCHER et al.) 09 February 1975 (09-02-1975) Whole Document.	1, 2, 6, 11, 12, 13, 15, 18, 19, 21, 22, 25
Y	JP 07237857 A (YOSHITADA) 12 September 1995 (12-09-1995) Translated Abstract; Figures 1, 2 and 7.	1, 2, 6, 7, 8, 11, 12, 13, 15, 18, 19, 21, 22, 23, 24, 25
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[ ] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
29 March 2006 (29-03-2006)	10 April 2006 (10-04-2006)
Name and mailing address of the ISA/CA Canadian Intellectual Property Office Place du Portage I, C114 - 1st Floor, Box PCT 50 Victoria Street Gatineau, Quebec K1A 0C9 Facsimile No.: 001(819)953-2476	Authorized officer Hong Tin Tiv, E.-I.-T. (819) 956-8720

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CA2005/001905

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